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Journal of the Society of Arts.

FRIDAY, MAY 16, 1862.

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CONVERSAZIONI.

The second and third Conversazioni of the present season will be held at the South Kensington Museum, on the 9th of July and the 8th of October.

INTERNATIONAL EXHIBITION OF 1862.

SEASON TICKETS.

Members of the Society and others are informed that Season Tickets may be obtained at the Society's house, on application to Mr. S. T. Davenport, the financial officer. Price three guineas and five guineas, the latter also admitting to the Horticultural Gardens and *fetes* during the season.

GUARANTEE.

The Council beg to announce that the Guarantee Deed is still lying at the Society's House for signature, and they will be much obliged if those gentlemen who have given in their names as Guarantors, as well as others interested in the Exhibition, will make it convenient to call there and attach their signatures to the Document. Signatures for sums amounting in the aggregate to £451,100, have been attached to the Deed.

TWENTIETH ORDINARY MEETING.

Wednesday, May 14th, 1862.

The Twentieth Ordinary Meeting of the One Hundred and Eighth Session was held on Wednesday, the 14th inst., Thomas Sopwith, Esq., F.R.S., Member of the Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Chapman, David Ward ..	Totness-park, Sunningdale, Berks.
Clabon, John Moxon......	21, St. George-street, S.W.
Cowper, Samuel T.........	Leeds Iron Works.
De Vandoni, Gen. Count.	45, Manchester-street, Manchester-square, W.
Dobson, J. T................	Hull.
Fleming, George	22, St. James's-street, S.W.
Fox, Thomas...............	Lordship-lane, Tottenham, N., and 93, Bishopsgate-st., E.C.
Gardener, Chas. Henry...	West Harding-street, Fetter-lane, E.C.
Hall, Collinson	Navestock Hall, Essex.
Hall, Ralph	Manchester.
Hannay, John	Springfield, Ulverston.
Knight, J. G................	Secretary to the Victoria Commission of the International Exhibition of 1862.
Low, Sampson, sen.	47, Ludgate-hill, E.C.
Marshall, J., M.D.	Queen's-rd., Up. Norwood, S.
Maule, George	1, Kennington-road, S.
Neilson, Walter...........	172, WestGeorge-st., Glasgow.
Overend, James...........	47, Parliament-street, S.W.
Pearson, Z. C...............	34, Great St. Helen's, E.C., and Hull.
Rodoconachi, M. E.	3, Gloucester-square, Hyde-park, W.
Ryley, Edward Chas. ...	16, Gt. Prescot-street, Goodman's-fields, E.
Sharman, Edward Alfred.	2, Heathcote-street, Mecklenburgh-square, W.C.
Shaw, George...............	9, King Edward-street, E.C.
Siebe, Daniel	17, Mason-street, Lambeth, S.
Spence, Joseph	22, St. James's-street, S.W.
Summerscales, John	Keighley, Yorks.
Taylor, George	Clarence Iron Works, Leeds.
Traer, J. R., F.R.C.S. ...	47, Hans-place, Sloane-street, S.W.
Ward, Reginald............	20, Albion-road, St. John's-wood, N.W.
Weston, Joseph D.	Stanhope-villa, White Ladies'-road, Clifton, Bristol.
Wickens, H.	112, Camden-rd.-villas, N.W., & 4, Tokenhouse-yard, E.C.
Young, William Joseph..	Roker, Sunderland.

And as Honorary Corresponding Member.

Kaznadar, The General Mustapha	First Minister and Minister for Foreign Affairs to the Bey of Tunis.

The following candidates were balloted for and duly elected members of the Society:—

Anketell, Wm. Robert ...	West-hill, Harrow, N.W.
Billinge, James	Ashton, Lancashire.
Dalrymple, James	Langlee-house, Galashiels, N.B.
Du Pré, Caledon George, M.P.	40, Portland-place, W.
Gurney, James	67, Addison road, Kensington, W.
Heinke, W....................	79, Great Portland-street, Portland-place, W.
Irving, John	94, Eaton-place, S.W.
Moore, John	104, Bishopsgate-st.-within, E.C.
Newhouse, Titus	10, Douglas-road, Canonbury, N.
Painter, Thomas	Wrexham.
Petherick, Horace William	2, Rosa-villas, Lillie-road, St. John's, Fulham, S.W.
Plumptre, Chas. John ...	1, Essex-court, Temple, E.C., and 26, Elgin-road, Kensington-park-gardens, W.
Preller, E.	Bradford, Yorks.
Steele, Andrew	33, Great George-st., S.W.
Tarring, John...............	26, Bucklersbury, E.C.
Walsh, Edward	10, Darnley-road, Royal-crescent, Notting-hill, W.
Ward, Henry	100, Great Russell-street, Bloomsbury, W.C.

The Paper read was—

GOLD MINING AND THE GOLD DISCOVERIES MADE SINCE 1851.

By John Arthur Phillips.

It would be obviously impossible to attempt to give, within the limits of the present paper, a detailed account of all the valuable gold discoveries which have been made within the last ten years, and I shall therefore necessarily confine myself to the more important only, but shall at the same time briefly notice various modifications which experience has introduced into the processes for treating auriferous ores, and succinctly advert to some of the causes which have unfavourably influenced this class of industry.

Gold is usually found in a quartzose gangue, traversing altered palæozoic shales, and these deposits are frequently richest in the vicinity of eruptive rocks. The oldest stratified rocks have been seldom found auriferous, but the sedimentary deposits which follow in the series (*i.e.*, those generally ascribed to the Silurian, Devonian, and Carboniferous epochs,) have, particularly when highly metamorphosed, yielded the largest amounts. Of these, those usually described as Silurian rocks have been by far the most productive, but instances are not wanting, even in Europe, of small quantities of the precious metal having been found in the conglomerates of the Carboniferous period.

Gold almost always, if not always, occurs in the native or metallic state; generally in the form of small flakes or granules, but occasionally in masses of considerable weight. It is never pure, being invariably alloyed with silver, and frequently contains small proportions of iron and copper.

Gold is also often associated with various metallic sulphides, such as copper pyrites, galena, blende, and particularly with iron pyrites and mispickel. It appears somewhat doubtful whether, in every instance, all the gold in metallic sulphides exists in the form of minute metallic particles, or if, in some cases at least, it may not be present in combination with sulphur. I may however observe, that from the results of numerous experiments on this subject, I am inclined to the belief that gold does sometimes occur in small quantities in the form of sulphide, but that oxide of gold, for the extraction and utilization of which sundry much vaunted processes have been devised, does not exist in any of the known auriferous ores.

The extraction of gold from the sulphides would, by the ordinary process of amalgamation, present considerable difficulty, and consequently it will often be found advantageous to separate and collect the pyrites, &c., contained in the tailings, and subsequently to subject them to metallurgic treatment by fusion either with galena, litharge, or some other lead product.

The most important gold discoveries made during the last ten years are those of British Columbia, New Zealand, and Nova Scotia; but it may also be observed, that gold in paying quantities has been recently discovered in the neighbourhood of Dolgelly, in North Wales.

British Columbia.—As early as June, 1856, Mr. Douglas, the Governor of Vancouver's Island, reported to the Secretary of State the discovery of gold in the British territory, north of the 49° of latitude, and stated that the earnings of the diggers ranged from £2 to £8 a day. In consequence, however, of the hostile attitude assumed by the natives, the number of diggers was very limited. Altogether this discovery attracted at first less attention than might have been anticipated, but in December, 1857, Governor Douglas reported that the Indians themselves were extensively engaged in the search for gold, and that the accounts which had reached the neighbouring states of America had caused considerable excitement. It was not, however, until May, 1858, that a stream of immigration sufficient to overpower the opposition of the aborigines had fairly set in, and the British public learnt, for the first time, that the mainland of new Caledonia, as the district extending from the Red-river to the Pacific was somewhat vaguely designated, was a rich and beautiful land, which gave every promise of becoming a flourishing and highly important colony.

The *Times* correspondent, writing from Victoria, Vancouver's Island, under date of January 20th of the present year, says:—"Beginning with Fraser River, the main artery of the auriferous region, I may state that gold is known to exist, and has been worked at a great many places in the river and on its banks, from a point about 45 miles from its mouth up to near its source in the Rocky Mountains; in other words, from the 49th up to the 53rd parallel of north latitude, a distance (taking in the windings) of some 800 miles. The south branch of the Fraser has its sources near Mount Brown, in the Rocky Mountains, in about 53° north latitude, 118° 40 m. west longitude. Thence this branch flows for 290 miles to Fort George, a post of the Hudson's Bay Company. The north branch rises in an opposite direction. It receives its supply from a series of lakes lying between 54° and 55° of north latitude; longitude about 124° 50 m. west, and runs a course of 260 miles to its junction with the south branch, some miles below the 54th parallel of north latitude. Here the union of the two branches forms the Fraser River proper. Adding the north branch, which is also a gold-bearing stream, and which was worked last season, to the other arm, the two will give us a continuous stretch of auriferous riverain territory upwards of 1,000 miles in length, extending for many miles back into the country, but not including the tributary rivers which fall into the Fraser. In short, the river itself is now known to be auriferous, and to pass through a gold-bearing country throughout its whole course. Gold is also found in most of the tributaries of the Fraser, of which no less than 59 are known. The great length of the main river, and the number of its tributaries, will give some idea of the auriferous resources of the country.

"But these facts do not by any means convey a comprehensive or accurate view of the vast extent of the area of the goldfield, because they are limited to the central portions of the country, while the whole of the upper portion of British Columbia, from its southern to its northern boundary, is auriferous.

"Besides the gold found in the beds and on the shores of these streams, the Fraser itself and many of its tributaries are skirted and bordered by terraces, all of which yield gold also. These terraces, or benches, as the miners call them, run at intervals along both sides of the rivers for miles in length, and they recede where the mountains retire for distances back into the valleys varying from a few acres to a few miles in breadth. They are objects of curiosity and speculation, and add much to the beauty of the rude scenes in which they occur, from the regularity and evenness of their structure. They generally occur on both sides of the river (opposite to each other) at the same place, sometimes at the same elevation on both sides, sometimes at different elevations, high on this and low on the other side of the river, and in some places they are multiplied into several successive level parallel plateaux, rising one above the other as they recede from the bank. These terraces are composed of the ordinary alluvial deposits, loam, gravel, stones, sand, and boulders, and they are thick masses rising generally to a height of 150 to 200 feet."

From the statement of the same writer, there would also appear to be abundance of gold found in other localities besides the vicinity of the Fraser. Large yields have been obtained from the diggings between Fort Hope and Fort George, about 100 miles from its mouth. These mines are said to have yielded during the last season an average of 17 dols. to the hand, and a party of three men took from three days' diggings 240 dols. At Okanagan, sixty miles distant, the average produce is stated to have been 4 dols. to the hand. The Thompson River and its tributaries had also proved highly auriferous. North River gave from 8 dols. to 10 dols. to the hand, and on the Barrière a community of French Canadians made each as high as 50 dols. per diem.

Cariboo, however, appears to be the largest and richest of all the gold districts hitherto discovered. In confirmation of this, it may be stated that at Steele's claim, Williams's Creek (Cariboo), a company of five partners commenced their operations during the summer months. They began their preparations by sawing timber for their sluices, and at first their claim did not promise as much as many others. During the first three days they obtained little or nothing, but on the fourth day their labours were rewarded by the collection of 4 ozs. of gold. On the fifth day they made 10 ozs., and on the sixth 41 ozs. From that time the yield went on increasing until it reached 387 ozs. a day, whilst the last day's work gave a return amounting to 469 oz. The five partners employed four hands to assist them in clearing away the tailings. The labourers were paid 8 dols. per day each, in addition to their board, and the total value of the gold raised during not more than two months' actual work was equal to a money value of £21,875. The total area of the claim so worked was 80 feet by 25 feet, thus showing the extreme richness of some of the deposits of British Columbia. I cannot, however, refrain from remarking on one of the inferences that might be drawn from the statement of the *Times* correspondent. He would appear to imply that the gold fields of British Columbia afford all prizes and no blanks.

This is, I confess, a somewhat different conclusion from that at which I should myself arrive, after considerable experience in some of the most important gold districts. We generally hear a great deal about the prizes, while little or nothing is said of the blanks; and I certainly entertain considerable doubt as to whether the glowing accounts which from time to time reach this country through the medium of the newspapers, are at all times to be relied on. Of one fact, however, I am quite certain, and that is—that I was some years since acquainted with the correspondent of one of our leading journals, who, having taken up his residence in the part of the country in which I was then living, made a large fortune by land speculations, which were in no small degree fostered by means of the articles appearing in that paper.

I would not of course impute anything like wilful misrepresentation to the resident correspondent, but it is evidently difficult to take a dispassionate view of facts and circumstances around us when our material interests are deeply involved in favour of a foregone conclusion.

There can, however, no longer be any doubt but that gold-fields of extraordinary richness, and as far as the alluvial washings are concerned, easily worked, exist in almost all parts of the colony, and also that water is plentiful; and I merely throw out these remarks for the benefit of those who, from reading the letters in the *Times*, may be induced to believe that a large fortune is to be made out of mere existence in British Columbia. Let those who go out be determined to get their own living by the exercise of industry and the strength of their own arms, and they may rest assured that an honourable independence may be realised in the colonies with much greater facility and certainty than in any European country.

NEW ZEALAND.—Early in the present year, accounts reached this country of gold discoveries having been made in New Zealand, and although, as far as I am aware, no very detailed reports of the method of its occurrence have yet been received, there is every reason to believe that remunerative deposits of the precious metal have been found in this colony. A letter, published in the *Daily Telegraph* in March last, states that:—

"The great influx of gold into Dunedin, from the Otago gold-fields, still continues. On the 22nd and 28th of November, and on the 15th of December last, the escorts conveyed respectively 21,000, 15,000, and 14,000 ozs. The total amount of gold brought down by escort, up to the 20th December, is 191,831 ozs., which, at £3 17s. per ounce, is of the value of about £738,550. This is independent of what has arrived here through private hands. New diggings are continually being discovered in the locality."

It also goes on to say that, "It will not be long before New Zealand will be recognised as a gold-bearing country, for it is known that the whole of its mountain ranges are auriferous, from the south to the extreme point of the north."

Also, the *Otago Daily Times*, of the 17th February, has the following remarks on the rapid progress of that settlement, consequent upon the discovery of gold-fields in the immediate vicinity:—"The population of Otago is on the increase, and the gold-fields continue to prove very productive to the number of miners engaged in working them. Every day tends to prove that gold exists in payable quantities over a large portion of the province, and that gold mining will continue to form a profitable pursuit to a large population for many years to come. The most noticeable event during the last month has been the discovery of a new gold-field on the Lammerlaw Creek, near its junction with the Waipori. Opinions respecting it are more or less conflicting, but the general belief is that it will prove a valuable addition to the already opened gold-fields."

I am not in possession, however, of any special information relative to this colony, and shall consequently pass on to notice the gold-fields of Nova Scotia, which I have recently visited, and with which I am, therefore, better acquainted.

NOVA SCOTIA.—The whole of the Atlantic shore of the province of Nova Scotia is bordered, in an unbroken line, by strata of a metamorphic character, and probably of great geological antiquity, frequently broken through by eruptive rocks. These form a coast in some places low and rugged, and in others boldly undulating; their soil is generally rocky and sterile, although there are large tracts well covered with timber, and affording prosperous agricultural settlements. Along the Atlantic shore this district is generally low, gradually rising to a height of some three hundred feet as it advances northward. Its coast line has, according to Dr. Dawson, a general direction of south 68° west, whilst its inland boundary, although presenting some considerable undulations, has a direction of south 80° west. The extreme breadth of this band at Cape Canseau, its northern extremity, is about eight miles, whilst in its extension westward it gradually increases until, at the west branch of St. Mary's River, eighty miles west of Cape Canseau, it is known to be thirty miles wide. In the western counties, its width has not yet been accurately ascertained, but here its entire breadth cannot be far short of fifty miles. Its total length corresponds with that of the peninsula of Nova Scotia.

This band, in which almost the whole of the gold discovered has been found, chiefly consists of thick bands of slate and quartzite highly inclined, and having a general north-east and south-west strike. In different localities these rocks, which probably belong to the Silurian epoch, have been penetrated by masses of granite, and in their vicinity the quartzites and clay slates usually present a highly metamorphosed appearance.

Since the gold discoveries in California and Australia have been generally known, and public attention has been directed to the conditions under which deposits of the precious metal usually occur, reports of similar discoveries have from time to time locally arisen in different parts of Nova Scotia. In every instance, however, either mica or iron pyrites would appear to have been mistaken for gold. Some years since, also, a considerable amount of excitement was caused by an article in *Blackwood's Magazine*, in which it was affirmed that gold would be found in the hills to the south of Annapolis, and comparisons were instituted between that locality and the Valley of the Sacramento. Many persons were induced, by this article, to leave their ordinary occupations to seek for gold, but their researches having in all cases proved unsuccessful, the fever gradually subsided, and the subject was ultimately forgotten. It is also worthy of remark that Dr. Dawson, so long ago as 1855, when describing the great metamorphic band, observes:—"Quartz veins occur abundantly in many parts of this district, and it would not be wonderful if some of them should be found to be auriferous."

There is nevertheless no authentic evidence of the discovery of the precious metal in the province previous to 1860, when some hundreds of persons, tempted by rumours of gold having been found, commenced exploring near the head waters of the Tangier River. The amount of gold obtained in this locality was, however, so small, that the miners ultimately became discouraged, and the excitement gradually subsided. In the month of March, last year, a man who was stooping to drink at a brook, observed a piece of gold among the pebbles at the bottom, and having picked it up, searched and found more. This took place about a mile to the east of the Tangier River.

From this date attention became directed to the locality, numerous claims were taken up, and considerable quantities of gold were obtained by breaking the quartz with hammers, and washing the resulting dust in tin pans.

In June, the discovery of gold was reported at Lunenberg, at a locality called the "Ovens." The veins at this place, although generally small, are frequently highly auriferous, and appear to cross each other in almost all directions, in a metamorphic shale belonging to the great southern band. On these discoveries being made known, numerous claims were immediately taken up, and various companies formed for working the veins presenting themselves numerously in the cliff.

Shortly after the discovery of the auriferous nature of the quartz veins, it was found that the sands on the beach beneath the headland also contained large quantities of gold; here claims were likewise rapidly staked off and worked by means of cradles, so that the aggregate daily yield, from the several shore operations, soon reached one hundred ounces.

Gold discoveries subsequently followed each other in rapid succession, at Lawrence-town, Dartmouth, and Sheet, and Isaac's Harbours, Sherbrooke, and Laidlaw's farm.

The most remarkable deposit of auriferous quartz hitherto found in Nova Scotia is undoubtedly that at Laidlaw's farm. The principal workings are here situated near the summit of a hill composed of hard metamorphic shales, where openings have been made to the depth of some four or five feet upon a nearly horizontal bed of corrugated quartz of from eight to ten inches in thickness. This auriferous deposit is entirely different from anything I had before seen, and when laid open presents the appearance of trees or logs of wood laid together side by side after the manner of an American corduroy road.

From this circumstance the miners have applied the name of "barrel quartz" to the formation, which, in many cases, presents an appearance not unlike a series of small casks laid together side by side and end to end.

The diagram on the wall will serve to explain the mode of occurrence of this deposit.

The rock covering this remarkable horizontal vein is exceedingly hard, but beneath it for some little distance it is softer and somewhat more fissile. The quartz is itself foliated parallel to the lines of curvature, and exhibits a tendency to break in accordance with these striæ.

The headings, and particularly the upper surfaces of the corrugations, are generally covered by a thin barklike coating of brown oxide of iron, which is seen frequently to enclose numerous particles of coarse gold, and the quartz in the vicinity of this oxide of iron is itself often highly auriferous.

The other gold veins of the province present, generally speaking, few distinctive peculiarities, and very closely resemble those found in California and Australia. Their general course is north 60° west, and their dip towards the south, but there are not unfrequent exceptions to this rule.

In addition to gold, the most auriferous veins of Nova Scotia contain variable quantities of iron-pyrites, mispickel, galena, blende, and less frequently a small proportion of argentiferous and auriferous sulphide of copper. Here, as elsewhere, the presence of the sulphides is regarded as a favourable indication of the richness of a vein, and leads containing much disseminated galena almost invariably yield a remunerative quantity of gold.

The productive veins hitherto discovered have, as before stated, been found in the older rocks on the Atlantic shore, and commonly occur in parallel groups, near the centre of which, and parallel to the productive veins, a large reef of crystallized and comparatively unproductive quartz is in many instances found to run. These large courses are locally called "bull veins," and usually contain small quantities only of the precious metal.

The attention of the Nova Scotian goldminers has, contrary to the usual practice, been almost entirely directed to the exploration of the veins of gold quartz, and alluvial digging has consequently been all but entirely neglected. There is, however, every reason to believe that a careful examination of the alluvial deposits would lead to the discovery of large quantities of gold.

It would be impossible to form any reliable estimate of the total amount of gold which has hitherto resulted from mining operations in Nova Scotia, as the claims are for the most part worked by private individuals who are generally indisposed to furnish information either as to their success or failure, and no official returns on the subject have as yet appeared. It is manifest, however, from the characteristics of the localities in which the precious metal has already been discovered, and the great extent of the gold-bearing portions of the province, that there is every reason to anticipate that further and more important results will be developed by the workings and explorations of the present summer, and that, ere long, Nova Scotia will take an important position among gold-producing countries.

The thickness of its auriferous veins is perhaps less than those of California and some other countries, but they are, generally speaking, richer in visible gold than the average of those I have seen in any other part of the world. It must also be taken into consideration that Nova Scotia possesses many decided advantages over both California and Australia. Each of these countries is situated at a great distance from Europe, and can only be reached after a long and expensive passage, and, as a natural consequence, wages were for a long time exceedingly high and provisions proportionately dear. Nova Scotia, on the contrary, is within an easy distance both from Europe and the United States of America, and possesses a considerable settled population of intelligent, industrious, and sober people, eminently adapted, after a little experience, to become steady and efficient miners. The whole of the gold-bearing portion of the Province also lies within a convenient distance from the coast, which abounds with magnificent harbours, affording ample security to shipping, whilst wood in large quantities is to be everywhere procured for all descriptions of mining uses, and an abundant supply of water is generally to be met with for the purposes of washing and amalgamation.

From these circumstances, it is impossible that wages can ever reach the extravagant rates that mainly led to the failure of nearly all the gold-mining enterprises of 1852, since which period many of the mines have been advantageously worked which were then abandoned on account of the enormous expenditure necessary to carry on the operations.

GOLD OF NORTH WALES.—The gold district of North Wales would appear to be chiefly confined to an area of about 20 square miles lying on the north of the turnpike road leading from Dolgelly to Barmouth. In this region the Cambrian rocks are overlaid by the Silurian, and the general geological features of the country strongly resemble those of other auriferous localities.

The most important discoveries have been made in the Dol-y-frwgnog, Prince of Wales, and the Clogau mines, of which the latter only is at the present time worked with remunerative results. So long ago as 1844 a paper was read before the British Association by Mr. Arthur Dean, who stated that a complete system of auriferous veins exists throughout the whole of the Snowdonian or Lower Silurian formation of North Wales. In consequence of this statement operations were commenced at Cwmhesian, but the results obtained not having been found satisfactory they were finally abandoned. Ten years subsequent to this the mine was again worked for gold, but still with unfavourable results. Machinery for crushing and amalgamation was about two years afterwards erected at Dol-y-frwgnog, but, after operating on several hundred tons of quartz, the result was in this instance also a failure. Of all the auriferous veins in the neighbourhood of Dolgelly that at present worked in the Clogau mountain is certainly the most important. This mine is situated at a height of about a thousand feet from the level of the sea, and the workings are extended on what is called the "St. David's" or "Gold lode." This lode, which is almost perpendicular, runs nearly east and west, and is chiefly composed of auriferous quartz, more or less impregnated with sulphides of iron, lead, and copper. The vein stone also exhibits large quantities of disseminated gold, which generally occurs in a state of minute division. This mine is being worked on a small scale, and by means of very simple and far from perfect machinery; the following returns were however made during the course of the year 1861:—Ore crushed, 456 tons, 32 lbs; fine gold obtained, 2,884 oz., 1 dwt., 7 grs., being at the rate of 6¾ ounces per ton of quartz operated on. During the current year, up to April 26th, the results have been:—Ore crushed, 255 tons, 16 cwt., 16 lbs.; fine gold obtained 1,962 oz. 2 dwts., or 7⅝ ounces per ton of quartz.

It is needless to add that such a degree of success has given rise to the commencement of numerous mining operations in various parts of the district; but if gold mining in Merionethshire is approached in the speculative spirit that characterized the proceedings of 1852, it requires no prophet to foretell that numerous failures must necesarily be the result.

METHODS FOR EXTRACTING GOLD FROM ITS MATRIX.—The most simple and at the same time most ancient method for obtaining gold is undoubtedly by washing the sands and dirt with which it is found associated. On a small scale this may be performed either in a bowl or tin pan, but when greater expedition is sought, recourse must be had to appliances of a somewhat more complicated nature. Among the earlier miners in California and Australia the *cradle* was much employed. This instrument appears to have been introduced from Virginia and Carolina, and consists of an oblong inclined box, having a sieve at its upper extremity mounted on rockers, so that by means of a handle it may be swayed from side to side. The interior of this case is provided with a sloping diaphram of tightly-stretched canvass, and the bottom is divided into partitions by means of wooden cleets. Washing by the cradle is, however, a very slow operation, and requires a great deal of manual labour, since besides rocking it is necessary to supply it with water by means of a dipper, and to continually stir the fresh brought stuff deposited on the sieve. The gold and other heavy bodies retained between these wooden divisions are finally rewashed in a tin pan, and the metal is thus obtained in a pure state. The losses of fine gold attending this operation are very great.

The arrangement which next came into general use among Californian miners was the *long tom.* This consists of a long, roughly-made, wooden case, having a considerable inclination, and provided at its lower extremity with a sieve made of perforated sheet iron, beneath which is placed a "riffle box" divided into compartments, as in the case of the cradle, by means of slips of wood. Into the upper trough a stream of water is so directed as to fall with considerable force upon the auriferous drift with which it is charged, and this being continually stirred with a shovel, the finer particles are gradually washed through the sieve over the riffle box, whilst the coarser fragments are from time to time removed after being duly examined for any nuggets they may contain. The stuff retained by the riffles is afterwards washed in a pan, and the clean gold thus separated. The tom has the advantage over the cradle of getting through a much larger amount of work within a given time, but it requires a much more plentiful supply of water, and the loss of fine gold is great.

When conveniences exist for its introduction, the *sluice* has now generally superseded the tom. This arrangement is nothing more than a long run of wooden troughs provided with false bottoms in which augur holes have been bored to a certain depth, and in these mercury is generally placed. Through these inclined troughs the "pay dirt" is washed, and the metal, from its greater density settling in the depressions at the bottom, and combining with the mercury placed there for that purpose, is thus retained. These false bottoms are occasionally removed, and the mercury separated from the gold by filtration and subsequent distillation.

This process, although a certain portion of the gold is still lost, is generally much preferred to either of those above described.

It is also now customary, whenever a sufficient fall of water can be obtained, to direct a stream, by means either of metallic tubes or canvass hose, against the bench of pay dirt it is intended to remove. A powerful stream playing against the side of a hill will in a short time disintegrate a large quantity of dirt. The rubbish thus detached is conducted through a sluice in the usual way, and the gold is in this manner separated and collected. This method of proceeding is known by the name of *Hydraulic Mining* and is, generally speaking, considered the most economical that can be adopted.

When, instead of being found in deposits of pay dirt, the gold occurs in veins, associated with other metals, it becomes necessary to reduce the gangue to a state of fine division before it can be extracted. Two distinct methods are employed for the separation of this metal from the matrix with which it is associated, viz., washing and amalgamation.

In some countries, and particularly in Mexico, the *arrastra* is much employed for the treatment of auriferous minerals. This consists of a vertical axis, provided with cross arms, to which are attached, by means either of ropes or thongs of untanned leather, two or more heavy masses of porphyry. Mules are harnessed to one of the projecting arms, and a rotatory motion given to the shaft. The stones thus set in motion are dragged over a well-paved bed, and thus, by an action somewhat resembling that of the common muller and slab, the ore is gradually reduced. Mercury and water are added to the ores operated on, and the resulting amalgam is from time to time passed to the retort.

In some instances the ores are introduced into the arrastra in fragments of about the size of peas, but in large establishments it is first coarsely ground in a stamping mill. It is needless to say that grinding by means of the arrastra is a slow and expensive operation.

In Chili the *trapiche* is much used. This is nothing more than a grinding mill, like the ordinary edge-runner. The roller runs on a grooved bed-stone, in which a certain quantity of mercury is placed, and by the continual trituration of the revolving runner the ore is gradually reduced and amalgamation effected. This is, however, like the foregoing, a tedious and costly operation.

In some cases a mill like that commonly employed for grinding corn has been made use of, and found to answer remarkably well.

In one establishment where apparatus of both constructions is in operation, the ratio of the cost of grinding by the horizontal mill as compared to the edge runners, is as 2s. 3d. to 6s. 10d.

The ordinary roller crushing-mill has also been employed for the reduction of gold quartz previous to amalgamation, but it cannot be considered to be well adapted for this purpose. In the first place the whole of the stuff coming from the mill has to be passed through sieves of fine wire-gauze, and these become so rapidly worn by the rougher fragments which are being returned to the raff-wheel, as to render repairs constantly necessary, and the operation very expensive. Then, again, unless the ore be remarkably dry, these sieves choke, and the stuff is carried round and round without passing through; and, finally, if the ore be dry, such a dust is created as to nearly choke those attending to the crusher.

Among the quartz miners of California and Australia the stamping mill is now the machine almost universally employed. The ore is often first calcined in heaps or kilns, and, after stamping, the reduced mineral is passed through apparatus of various forms for the separation of the gold.

The calcination of the quartz, although not always adopted, is frequently productive of advantageous results.

Hard quartz is rendered much more friable by this treatment, and when a large proportion of sulphides is present, the expulsion of sulphur by the operation of roasting is likewise beneficial. It is also probable that when gold occurs in thin finely-divided laminæ, the ignition of the quartz produces such an agglutination of its particles as to cause them to offer less surface to the action of the water, and that the loss of "float gold" is thereby diminished.

The metal is separated from the stamped ore either by washing alone, or by washing and amalgamation. When the former process is resorted to, the stuff flowing from the stamping mill is either allowed to pass over riffle-boxes, or is conducted over blankets, or skins on which the hair is retained. These are occasionally washed in proper vessels, and the metal retained by them thus collected. The gold so obtained is, in most instances, concentrated by washing in a *batea* or otherwise, and finally amalgamated, or less frequently fused with litharge, or an ore of lead, and finally cupelled.

When amalgamation is employed, the riffle-boxes may be charged with mercury, or the auriferous sands produced can be passed through triturating apparatus containing mercury with which the gold is caused to combine. In some cases barrel amalgamation is resorted to. The diagram on the wall exhibits a combination of three of the most efficient amalgamating appliances used by the miners of California and Australia, which is well calculated to separate the precious metal from ordinary gold quartz. The ore flowing from the mill first passes over a lip through a triturator not unlike that employed at Zell in the Tyrol, and then falls into an apparatus, the action of which is similar to that of the amalgamating barrel. Finally, the whole of the stuff before passing over riffle-boxes or blankets, is agitated in a column of mercury through which it is made to descend. In some instances, where water is not plentiful, that from which the tailings have settled is again pumped round. In this case a little wood ashes should from time to time be thrown into the mill. This is employed for the purpose of saponifying any oil or other fatty matter which, if present in *even the most minute proportions*, when quicksilver is used, would, by preventing the particles of gold from uniting with the mercury, materially interfere with the results obtained. It is, therefore, of great importance in all quartz-crushing and amalgamating establishments, that proper care be taken to prevent any dropping of oil from the bearings into the apparatus, since the result of such an accident would inevitably be a notable falling off in the produce of gold obtained. In order to prevent loss occurring through this cause it would, as before stated, be found advantageous to throw from time to time into the mill a little wood ashes or some other alkaline body, for the purpose of removing any greasy matter which may have become accidentally introduced.

When the quartz contains an appreciable quantity of auriferous sulphides, it would in many cases be found advantageous to separate these from the tailings by means of a Hundt's buddle applied to the end of the riffles. The sulphides thus collected might be treated either by fusion with oxide of lead, and the produce cupelled for gold, or after a preliminary roasting be again subjected to amalgamation. The former process will, however, in many instances prove the most advantageous.

As an instance of the small yield of gold which, even in Australia, is at the present time found remunerative, I would quote the following results of the Colonial and Port Philip Company. It must, however, be observed that, to obtain a satisfactory profit from ores of this class, it is necessary not only that large quantities should be treated, but also that the greatest economy should be observed in every department of the manipulation.

The quantity of quartz crushed by this company between October 1st, 1860, and September 30, 1861, was 32,258 tons, from which the produce was 24,336 ozs. 6 dwts., being an average of 15·2 dwts. per ton. The quantity crushed during the preceding year was 21,693 tons, and the produce 17,466 ozs., being an average of 16 dwts. per ton, showing an increase in crushing of 10,563 tons, and on the yield of gold of 6,870 ozs. over the same period of the previous year. It will be perceived that the yield of gold per ton had experienced a variation of 22 grs., equal to 5¾ per cent. The total expenditure per ton has been 12s.; in the preceding year it was 16s. The profit on the quartz crushing for the year ending September 30th was £22,958 16s. 5d.

ASSAY OF ORES CONTAINING GOLD.—Minerals containing gold are in most instances assayed in precisely the same way as those affording silver.

To make an assay of auriferous quartz, the sample to be operated on is first finely pulverised, and a given weight subsequently well mixed with litharge, carbonate of soda, borax, and an amount of charcoal dust sufficient for the production of a button of lead of a convenient size for cupellation. The metallic globule remaining on the cupel after this operation will contain all the gold present in the ore, together with any silver that may be associated with it, as well as a certain minute portion of that metal derived from the lead of the reduced litharge.

In the case of the poorer ores, containing less than 10 dwts. of fine gold to the ton, the silver derived from the litharge will frequently be found amply sufficient for the purposes of inquartation, whilst for the richer varieties the addition of a little pure silver at the time of placing the button on the cupel is often necessary. When, in addition to gold, the ore contains small quantities of iron pyrites, or other sulphurised mineral, it not unfrequently happens that the admixture of charcoal or any other reducing agent becomes unnecessary, and the fusion may be made with litharge alone.

When, however, pyrites, blende, or other metallic sulphides are present in large quantities, the sample must either be treated by scorification, or it must be first roasted until all the smell of sulphur has disappeared, and then treated as in the case of substances not containing that body, but with the addition of a large proportion of borax. It is, however, to be remembered that when any of these compounds contain sulphur, it is of importance that the whole of it should be removed either before or during the process of obtaining the leaden button, since otherwise, and particularly in the presence of alkaline fluxes, a portion of the gold may enter into combination with the slags in such a way as not to be entirely separated from them by the action of metallic lead.

It may be proper to remark here that although nothing is more easy than to estimate with great accuracy the amount of gold contained in any given specimen of gold quartz, it is considerably more difficult to obtain a fair average sample of the usual produce of a vein. When the metal is in a fine state of division, and equally disseminated throughout the gangue, this presents less difficulty; but when, on the contrary, it occurs in pockets and irregular deposits, it frequently requires the exercise of great care in order to avoid falling into very serious errors.

It is consequently of the highest importance that whenever ores are to be assayed for gold, the greatest care should be observed in preparing the samples on which the operation is to be conducted. With this view, the heaps or piles should be fairly cut through, two or three tons being taken from each parcel of importance, and reduced to fragments not exceeding the size of beans; this may be effected, when crushing machinery is not available, by breaking the ore by the aid of properly-shaped hammers on iron plates. This operation is technically called "bucking." The ore thus prepared is now to be thoroughly mixed, again made into a pile and again cut through, taking out of it this time from three to four hundred weights, which are reduced to the state of fine powder, either in a large mortar or by grinding on an iron plate. After well mixing, this powder is again cut through, and about 20 lbs. weight taken, for the purpose of being still further reduced in size, and passed through a sieve of fine wire gauze. Should any flattened particles of gold remain in the sieve, they are to be carefully collected, cupelled, and parted, and due allowance made for them in the result obtained by direct assay. Of the finely-divided ore which has passed through the sieve, at least six different assays of one thousand grains each should be made, and their mean result taken as representing the produce of the parcel of ore of which it is the object to determine the value.

By operating in this way, almost absolute accuracy may be ensured; but when a less degree of exactitude is necessary, the quantity of crushed ore may be reduced and the number of assays fewer.

If after thus accurately testing the produce of a parcel of ore, it be passed through the most efficient crushing and amalgamating machinery with which we are acquainted it will be found that the total amount of gold originally present in the stuff is never obtained, and if this deficit be sought for in the tailings resulting from the operation, it will be discovered that a certain small quantity of the precious metal still remains unaccounted for. This deficiency would appear to be due to the circumstance of minute particles of flattened gold having floated off on the surface of the water, and frequently amounts to nearly two dwts. per ton of ore treated.

When the ore to be examined contains silver in addition to gold, and it is desirable to ascertain its amount, it becomes necessary first to cupel the button of lead without the addition of silver; the metallic globule thus obtained is weighed and its weight noted, deduction being made for the weight of silver derived from the reduced litharge, which must be ascertained by a distinct cupellation. If more silver is required for the operation of parting, it is added, and the button, together with the fragment of silver, is enveloped in a piece of pure lead foil, and again cupelled. Lastly, the resulting globule is dissolved in nitric acid, and the gold weighed. The weight of silver present in the ore will consequently be represented by that of the button of alloy obtained from the first cupellation, less the united weights of the gold and the silver resulting from the reduced litharge.

In concluding this subject I cannot better express the great importance of obtaining fair samples than by quoting the words made use of by Dr. Percy, in a lecture delivered in 1852, at the School of Mines, who, when speaking of gold assays, said, "Above everything be particular in obtaining an honest and fair sample. This is a matter of paramount importance, and of no small difficulty in many cases, but let there be honesty of intention and this difficulty will be generally surmounted."

Gold Mining Speculations of 1852.—Shortly after the discovery of the gold deposits of California and Australia, numerous associations were organised in the United Kingdom for the purpose of working gold mines in those countries, and I regret to say that, in almost every instance, these have resulted in the total loss of the capital so embarked.

Various circumstances have contributed to produce these disastrous results, but none more so than the fact that, in too many instances, sufficient attention had not been paid to obtaining samples fairly representing the average produce of the various veins which it was intended to work.

The specimens which reached this country were often picked samples, and on being placed in the hands of the assayer yielded a produce which was far from realised when fair average samples of the leads came to be tested on a large scale. Then, too, it was not unfrequently found that quartz veins, producing what should have been a remunerative amount of the precious metals, were situated in localities in which, either from the want of water or some other cause, their exploitation was attended with extraordinary difficulties. And, above all, the excessive price of labour, and all other mining requisites which then prevailed, was, in most cases, a sufficient barrier to anything like remunerative returns to the proprietary.

It is sufficiently evident that, in a country where an egg sells for a shilling, and a fowl for a guinea, a much larger amount of gold will be required in order to afford remunerative results than in one in which the necessaries of life can be procured at a more moderate rate; and it is also much less difficult to control the labour of a large staff of operatives where employment is comparatively scarce, than where any man of moderate industry may, by working on his own acconnt, earn nearly twenty shillings per day; the natural effect of such a state of society being, that, in the first place, work of all kinds is necessarily expensive, and, secondly, that the supply of labour is very precarious.

In all rich and newly discovered gold districts, which have for the most part a very limited resident population, the alluvial and easily worked deposits afford for a considerable time a superabundance of remunerative occupation for the newly arrived immigrant, but as these gradually but slowly become exhausted, something more than mere muscular strength becomes necessary in order to keep up the returns, a more systematic method of mining is adopted, a thorough combination of labour and the investment of larger capital are required.

It must, however, be remembered that these changes, although gradual even in a new colony, are infinitely more rapid than those who have always resided in European countries generally imagine. Ten years in the life of a colony, and particularly a gold-bearing one, effect greater changes in its commercial and social relations than a century in an old established country, and we have, consequently, no reason to be astonished that veins are at the present moment being advantageously worked both in Australia and California when, in 1852, such operations would have been attained by a certain and very considerable loss.

It is a generally admitted fact that veins of auriferous quartz have little or no relation, with regard to the expense of working them, with the more readily worked alluvial deposits in their vicinity. In the one case the rock has to be broken, crushed, and washed, at a considerable expenditure of time and money, whilst in the other, nature has for centuries been carrying on these operations and so preparing the gold as to admit of its extraction by very simple means. It consequently follows that the period at which quartz veins can be advantageously worked in any given locality will not entirely depend on their yield, but will also be more or less influenced by the abundance and richness of the alluvial diggings in their vicinity, and the general price of labour and materials in the district.

The supply and consequent price of labour must also be materially influenced by the distance at which the gold producing countries may be situated from the great centres of civilization. From their remoteness and their consequent difficulty of access, Australia and California for a considerable period offered striking examples of the demand for labour exceeding the supply, but the constantly increasing facilities afforded for travelling, and in some instances their nearer proximity to Europe, will probably prevent this occurring to the same extent in the more recently discovered gold fields.

There is, therefore, every reason to believe that the amount of gold annually derived from the working of gold quartz will go on gradually and rapidly increasing—and that, by the introduction of efficient and powerful machinery, ores of a very low produce will ultimately be treated with advantage.

These observations particularly apply to the Province of Nova Scotia, whose geographical position renders it impossible that labour should ever attain an excessive value, whilst, if a large supply of auriferous quartz can be obtained from the mines of North Wales, it is evident that a very small yield of gold, if continuous, might be rendered remunerative.

The operations of separating oxide of tin from its matrix, and gold from its ores, are, in many respects, exceedingly analogous, and consequently the expenses incurred in the one case may (all other circumstances being the same) serve approximately as a guide for estimating the cost which should be incident to the other.

The most efficient apparatus employed in this country for the reduction of ores to the requisite degree of fineness are undoubtedly to be found in the tin mines of Cornwall; and as an example of the expense attending the process of stamping, it may be stated that at Polberro Consols, in the year 1854, a 36-inch condensing engine, working at 55 horse power, stamped no less than 30,200 tons of tin stuff, at a total expenditure of 1s. 3½d. per ton. Each head stamped, therefore, 420 tons per annum, or 28 cwt. per 24 hours, whilst the whole number reduced 100 tons per day at a cost of 2s. 4d. per horse power. During the same year the average produce of the stuff stamped was 20¾ lbs. per ton, and the net profit on the operations £2,350 9s. 8d. If we now assume the value of black tin to be 8d. per lb., and that the expense of stamping an equal quantity of gold quartz would have been the same, the total value of the produce obtained from each ton will be 13s. 10d., or equal to a yield of about 3½dwts. of fine gold.

It must, however, be admitted that the cost of stamping a ton of ordinary gold quartz will be somewhat greater than that of treating an equal quantity of Polberro tin stuff, and that when the gold is in an exceedingly minute state of division, or where sulphides are present in large quantities, the separation of the gold may sometimes be attended with a certain amount of difficulty, but this difference will, in many cases, not be material.

It is therefore evident that when large quantities of auriferous quartz can be obtained in a country where the price of labour is not high, it is not necessary that it should contain a large amount of the precious metal in order to render its treatment by the aid of well constructed machinery remunerative.

As an instance of the very small yield which, under peculiar circumstances, may be rendered available, I would adduce the fact that at Schemintz, in Hungary, in the year 1842, the total quantity of ores stamped was above 40,000 tons, and the average of the useful metals extracted from 50 tons was—gold 3 oz.; silver derived from the separating process 3¾lbs.; lead similarly obtained 8⅓ cwts.; the ratio of the gold to the other materials being here as one to half a million. It is also important to state that in this instance the ores had to be broken from solid lodes, at depths extending to 200 fathoms from the surface.

DISCUSSION.

Mr. **MITCHELL** gave an explanation of a model of a machine exhibited by him, which he said was for the purpose of further crushing the gold ore after it passed from the stamping machine. It was found that the quartz was not crushed sufficiently fine when it passed from the ordinary machines, and it was necessary to subject it to a triturating action. Generally speaking, a machine like a common corn mill had been employed for such purposes, but his machine, he said, effected the trituration far more perfectly than the ordinary corn mill. It was nothing more than a modification of the mill employed for grinding coke and charcoal for founders' purposes, or for the grinding of indigo for calico printers. It consisted of a circular pan, in which were four balls of iron. In an ordinary mill the balls were so driven that they had a tendency to wear into an oval form, and the machine soon lost its efficacy. In the course of a short time the lower portion of the ball, which should rest upon the machine and the material to be ground, ceased to do so. To prevent that, in this machine the balls were driven by a conical roller. The effect of this was that the balls revolved upon two axes, so that they remained perfectly spherical, and fresh surfaces of the balls were constantly brought into play. In that case, if the substance submitted to the action of the machine were gold quartz, each particle of gold became polished by the frictional action of the balls in the pan, and was then more ready to be taken up by the mercury to which it was afterwards submitted. After it had been sufficiently triturated by this machine, which was determined by the size of the wire gauze employed, it was then passed into a gutter and ran into an amalgamating machine, which was composed of two troughs, divided in the centre by a partition. In each of these troughs a screw ran, both screws being turned by cog-wheels working one into the other, revolving in opposite directions, the operation of which was, as soon as the ore and water passed into the machine, a current was established by the action of the screws from one end of the troughs to the other. Before starting the machine mercury was placed in each of the troughs. There were 12 troughs in a complete machine, and these were used in succession. The ore passed into one trough and there remained for a certain time. The excess passed into the next trough, and so on until it passed through the whole series. To give an illustration of the progress of the ore from the first portion, from the triturators to the amalgamators, they might suppose they were treating ore which contained 3 oz. of gold to the ton. No. 1 amalgamator would remove something like 10 to 12 dwts. of gold from it, leaving still comparatively rich gold-quartz to pass to the second trough. That would remove a certain number of other dwts., leaving it still free to pass to the third trough, and so on until the final result was a gold quartz containing 3 or 4 dwts. only to the ton. Mr. Mitchell proceeded to give the results of this process in the various stages, ranging from 2oz. 5dwt. 17grs. to the ton in No. 1 trough, down to 2dwt. 2gr. in the last trough; and in the case of richer ore, containing 38oz. 12dwt. of gold to the ton, No. 1 trough would yield 16oz. 12dwt. of fine gold; No. 2, 10oz.; No. 3, 8oz.; No. 4, 5oz. 19dwt.; No. 5, 4oz. 5dwt. down to 1dwt. 23gr. The construction of the machine in question had been based upon the fact that both gold and silver ores, in the process of amalgamation, required a very large surface of mercury to be exposed, in order to extract the whole of their precious contents; and in this machine, with a series of twelve amalgamators, there were upwards of 250,000 square feet of mercury exposed to the ore passing through it in one hour. The amount of mercurial surface was larger than in any other machine. At the St. John Del Rey and other Brazilian mines, the ore was kept in contact with the mercury for 36 hours, but in the machines employed there the surface of mercury was comparatively small, whereas, if ore of that richness were placed in this machine, the contact with the mercury need not be continued more than 2 or 3 hours, because of the large surface of mercury employed. If a large surface of mercury were employed, it required less time; if a small surface of mercury were employed, it required a longer time. Consequently, in any machine for the extraction of gold from the ore, the object should be to have a large surface of mercury exposed.

Mr. **JOSIAH HARRIS** said, in the year 1854 and for two or three years afterwards, he devoted considerable time to the gold question in North Wales, and he would offer a few remarks with reference to the discovery of gold in that country, believing the subject to be of great importance. He believed Mr. Phillips had curtailed the extent of the area in Wales over which gold had been discovered. It extended over 60 square miles instead of 20, and contained numerous auriferous quartz lodes; in fact, he was of opinion the quantity was almost inexhaustible. The St. David's lode, instead of being nearly perpendicular, as stated by Mr. Phillips, dipped north about 18 inches per fathom, and was found to be rich in visible gold from near the surface to a depth of 23 fathoms. That discovery had taken place within the last two or three days, showing not merely surface deposits, but that they extended to a considerable depth, and were found to be equally as rich at the lowest part as at or near the surface. In 1853 Mr. Goodman, who had paid a great deal of attention to the subject of gold in Wales, found on the surface about 250 tons of auriferous quartz, which had been lying there for 18 years. 100 tons of that quartz were dressed for copper, when it was found to be so rich in gold, that the smelters were anxious to obtain an additional supply, but from some circumstance or other that wish was not complied with. At that time Berdan's pans were in vogue, and two or three of them were erected on the Clogau property. From a circumstance not well understood, although the ore was rich in visible gold, yet there was great difficulty in extracting it; the consequence was, the operation was abandoned, but within the last two years the mine had been reopened, and the same pans had been used with a different method of operation. Instead of 6 or 8 tons of quartz being passed through the pans per day, only from 20 to 30 cwt. per day were passed through them, and only one ball was used instead of two. The same machinery was used and the same description of quartz was operated upon, and it had been proved that this was not only a very rich mine, but one of the richest known either in this or in any other country. There were upon the table some extremely rich specimens, which had been obtained by Mr. Goodman from an ore which had been lying on the surface for 18 years; and such specimens as that shown would yield at the rate of something like 3,000 ounces of gold per ton. That, however, was an isolated specimen. At the Exhibition that day he had seen large masses of ore equally rich in gold, and he believed they were now working as much as 500 tons per week of that ore; and when it was considered that the same machinery was used now as formerly, it would be seen that some progress had been made in knowledge as to the mode of extracting gold from the ore. It was stated in the paper that the Cwmhesian mine was opened some years ago, but the results not having been found satisfactory the operations were finally abandoned. He (Mr. Harris) would state that the Cwmhesian property was worked in 1854, and the same machinery was used as at Dol-y-frwgnog for extracting the gold. The lode was extremely rich in comparison with many others. It contained 15 dwts. of gold to the ton of ore, and he believed there would be no difficulty in making that as paying a concern as the Clogau mine. The lodes were from 20 to 30 feet in width, exhibiting an almost inexhaustible quantity of gold quartz. At Dol-y-frwgnog as much as 12 oz. of gold per ton had been washed by hand, at a cost of £3. He found by the returns from the Port Philip colony, given in that day's *Times*, the average produce of the last month had been 10dwt. 8gr. per ton, and the cost of collecting and crushing was 8s. 4d. per ton, which left a large margin of profit, and if they could extract gold in Australia, where the expense of fuel, machinery, and labour was very great, and make a profit out of 10 or 12dwts. per ton, with the auriferous rocks of South Wales yielding 15dwt. per ton, he thought there was a fair chance of the profit being highly satisfactory.

Professor **Tennant** called attention to a model on the table of the last large nugget called the "Welcome" which had been received from Australia. He held in his hand the first nugget which was brought to England in 1851, which created so much sensation in the Great Exhibition of that year. It was from New South Wales; and the impression on the minds of some people appeared to be that gold would thereafter be so cheap that sovereigns would not be worth more than 2s. 6d. each, but sovereigns were as valuable now as they were then, although by reference to the excellent catalogue of the Victorian part of the Exhibition, he found that the amount of gold extracted from the mines of that country was worth something like £100,000,000 sterling, and the weight of gold exceeded £1,000 tons. What the probabilities of the future supply to the English market and the world were, he was not prepared to discuss. He had brought a specimen of gold quartz rock from Nova Scotia, which belonged to a gentleman who read a paper a few evenings since at the Linnæan Society. That was the kind of stone they were mending their roads with in Nova Scotia, and was one of the most interesting specimens he had ever seen from any country, having at one corner a large mass of gold. There was about £10 worth of gold visible, but the quantity invisible he could not say. It reminded him of a specimen which was some years ago offered to him for £25, but which he did not purchase, upon which the owner broke it up and obtained from it gold exceeding £42 in value. In the first place, they had to consider who were the persons who collected the gold, and what was the amount of their knowledge on the subject; and secondly, was gold the only substance which remunerated the emigrant. The mineralogist was acquainted with 500 minerals; gold was only one, and they had 499 others, and many of them very valuable—silver, copper, tin, antimony. There were in the case on the table specimens of most valuable minerals from Australia, which were disregarded in the search for gold. They had been in the habit of throwing away a black powder, which was supposed to be the oxide of iron, and considered to be worth not more than a few shillings per ton; but when a sample was sent over five years since, it was proved to be the oxide of tin, worth £45 per ton, which was then being all thrown away. He had placed in a case on the table specimens of various precious stones—the diamond, sapphire, ruby, topaz, &c., in their rough state, and he much questioned whether there were in the room twenty gentletlemen who could tell the nature of those specimens if they picked them up. If this were so, how could the navigators and sailors, who were amongst the most successful miners in the gold regions, be expected to distinguish them? They knew gold by its colour; but there were many other valuable substances with which they were not so familiar. Those who visited the Exhibition would do well to inspect the collection of diamonds in the Netherlands department, exhibited by Mr. Coster. He looked upon that as showing a finer collection of gems in their natural state than any other case in the whole Exhibition. There were in that case stones of the aggregate value of, he believed, £1,000,000 sterling. If those stones were thrown upon the pavement in a leading thoroughfare—except as regarded the polished specimens—he questioned whether one person in twenty would consider them worth picking up. He believed they were throwing away in the gold districts the substances to which he referred. Mr. Phillips had not alluded to one district in which he (Mr. Tennant) believed gold had been profitably worked—that was Canada. In the Brazilian Department of the Exhibition they would find some specimens of gold from a district which remained for future discoveries. In that case the gold occurred in granulated quartz, so soft that it could be crushed between the fingers. It was found in a district which was at present unhealthy, but as railways were being constructed to the interior of the country, he believed it was only a work of time for more gold fields to be developed. When they considered the large amount of gold that was annually used in the arts, it amounted in the aggregate to a considerable weight. The large quantity of gold used for picture-frames, the decoration of china, the facias of shop fronts, &c., was all lost. He had been asked what became of all the gold that was brought over to this country? His reply was, it supplied our wants, it enabled us to increase our commerce and civilisation; it extended our luxuries, and would go on doing so for many years to come. But he would draw attention to other substances belonging to the mineral kingdom—silver, copper, tin, antimony, bismuth, nickel, &c. If they could obtain the inferior kinds of diamonds they would be worth £50 per ounce, whilst gold was only worth £4 per ounce; but if these diamonds could be obtained at £5 or £10 per ounce, they would be the means of bringing many intractable materials into the useful arts which could not be used now in consequence of the cost of the material for cutting them. He begged personally to thank Mr. Phillips for his valuable paper.

Mr. EVAN HOPKINS had listened with great pleasure to Mr. Phillips's paper, which left very little to be remarked upon, but speaking generally on the subject of gold formations, and the systems of extracting it from the ore, according to his own experience, they had very little difficulty, in commencing in a gold field, to find the gold, beginning with the outcrop, and washing out the gold from the debris. Again, with regard to the quartz veins, when the surface had been washed away, they found no difficulty whatever in extracting the gold from the quartz. The Port Philip Company commenced their operations on a quartz vein which yielded on the surface ten ounces to the ton. It afterwards diminished to six ounces, and as the quantity operated upon and the depth of the workings increased, the average yield diminished; but in consequence of the introduction of stamping and the blanket system, as applied in South America, they were now able to make a profit with stuff producing only 10 dwts. per ton, and they in South America continued to make a profit with a yield as low as 6 dwts. per ton, provided they got 2,000 or 3,000 tons of stuff per month of that average quality. They found no difficulty in getting the remaining gold from the remains of the quartz by re-treatment and the use of finer stamps. At first when they used the Chilian mills with mercury they could not make three-quarters of an ounce per ton pay a profit. He was happy to say they could now work material yielding only 6 dwts. at a profit without quicksilver. The Columbian Mining Association had tried all kinds of machines and grinders, such as those represented, and many more, but they had all proved worthless. By grinding the raw material into an impalpable state in the first instance, they destroyed a large amount of the rough grain gold; and notwithstanding the grinding with the quicksilver for days together, there was a large amount of pure gold which did not become incorporated with the quicksilver, and that was a cause of great loss. That system was abandoned, and from that time they had been working even the refuse of the mines at a profit. All they wanted was plenty of material which yielded gold even as little as 6 dwts. to the ton. With regard to North Wales there was no difficulty in getting the gold. He had been lately at the Clogau mines. In one week he saw 9½ lbs. of gold obtained from 500 cwt. of quartz by the pestle and mortar machinery, and when they put up stamps he had no doubt they would get a greater yield, and would be able to reduce comparatively poor stuff with profit. The cost per ton at the Clogau, with their present mode of extraction, must be excessive. The cost of extraction at Marmato did not exceed 8s. per ton. With reference to the St. John del Rey, the material they were working upon only yielded 37s. worth of gold per ton, and yet they were making a profit of £8,000 or £9,000 per month, as the cost of production was only 17s. per ton, leaving a profit of £1 per ton; but they could not do that unless they had a great abundance of material to operate upon.

The CHAIRMAN inquired whether a model of the stamps employed in the Port Phillip works was in the Exhibition.

Mr. CHAS. FIELDER (Secretary to the Port Phillip Company) replied that the model was not yet complete, but would be at work in the course of the week.

Mr. HOPKINS added, that the auriferous pyrites required much more careful treatment than quartz. The gold in pyrites was in the most impalpable state, and would not bear the least agitation in water.

Mr. HARRIS inquired whether the company did not amalgamate, as well as wash and stamp.

Mr. FIELDER replied that the mixed process was employed. They amalgamated as well as stamped and washed.

Mr. R. A. MACFIE said the question had occurred to his mind, that whereas 400 years ago gold was found in the Pentland-hills and other parts of Scotland, they did not hear of its being sought for or found in that country in the present day.

Mr. HOPKINS was satisfied, if some of the Australian diggers were to go to Scotland, they would not be there a month without finding gold. He did not say it would be worth their while to do so, but if people took the trouble to look for gold they would find it in all countries where the primary slates are exposed, and he saw no reason why gold veins should not be found in Scotland as elsewhere.

Professor TENNANT mentioned that whilst on a visit at Black Mount, in Scotland, he found some specimens of quartz which contained half gold and pyrites. His statement having been doubted by the company assembled there, he extracted globules of gold from three specimens with a tobacco-pipe. This was proof that gold was to be found in Scotland, but it might cost 30s. to obtain 20s. worth of gold.

Mr. PHILLIPS, in reply to Mr. Harris, remarked that it was possible that he had underrated the extent of the gold-bearing district of North Wales, but he believed he was quite correct in stating that the whole of the veins hitherto worked were comprised within the area mentioned. With regard to the roasting of gold quartz referred to by Mr. Hopkins, he (Mr. Phillips) was only aware of one instance in which it appeared to be attended with prejudicial effects. In this case the ores contained large quantities of sulphides, and the gold existed in a state of minute division, and on roasting them in heaps with a large excess of wood, a portion of the gold appeared to have been carried off in washing in the form of alkaline double sulphides. In reference to the observation of Mr. Tennant respecting the Canadian gold fields, he might say that he had visited them nearly ten years since, but that their produce was so small as scarcely to render it necessary to include Canada among commercially gold producing countries. When speaking of Nova Scotia, however, he (Mr. Phillips) had omitted to mention that he had the day previous received a letter from his friend Mr. Annand, the Financial Secretary of the Province, who stated that at Sherbrooke, which at the time of his (Mr. Phillips) visit in November last, was entirely without houses, a small town, with hotels and other requisites, had sprung up, and that three crushing mills were already in progress of erection, the largest and most efficient of them having been forwarded from England by the London and Nova Scotia Gold Mining and Crushing Company (represented in England by Mr. Weir), who had obtained from the Government leases of some very valuable quartz veins situated at Sherbrooke and other places in the colony.

Mr. EVAN HOPKINS said, when he spoke of roasting the ore it was with reference to the cost of the process to the Port Philip Company. He did not think in that case the gain would be equal to the cost. With regard to the sulphides, when they roasted the pyrites they lost the silver, and they were now doing much better without roasting.

The CHAIRMAN was quite sure they would all agree that they were greatly indebted to the author of this paper for the valuable communication he made. He had seldom listened to a paper of greater interest, or to one in which the various points which the author had undertaken to explain had been more clearly brought forward. The subject he thought he might truly say, was interesting to every one. They had before them one of those models of enormous nuggets of gold found, and, resting their eyes upon that, they saw one of the greatest gems of gold-finding. But the real interest of this discussion rested with the various explanations that had been given by the author of the paper and by the gentlemen who had followed him, as to the discovery and treatment of auriferous ores; because it was evident it was not to chance discoveries like that before them that they were to look for any long-continued and permanently profitable source of gold-finding. The nuggets might be considered the prizes in the lottery, but the general yield of a district must be looked upon as the fair field offered to human industry, opened by Providence as a means of spreading property and civilization over the world, and of enriching countries which otherwise must have remained barren. Many of the remarks which had been made would be of the greatest possible use to many who were speculating in gold, or proposing to go forth in search of it. They would learn from them much practical wisdom, the result of sound observation and experience; and he considered the Society was under great obligation to Mr. Phillips and the other gentlemen for the candid and able manner in which they had communicated their views. The failures which had taken place in these enterprises, by reason of the enormous cost of labour, were a subject they could look upon as one pregnant with the greatest instruction; but he would, with their permission, mention what had been done, in the way of progress, in one gold-producing colony alone, in the course of the ten years which had elapsed since the first small nugget attracted so much attention in the Exhibition of 1851, because he thought it would bring before them a more vivid and distinct impression of the effects of gold-finding in a general aspect, than most persons would be prepared to expect. The colony of Victoria excited great interest for its gold in the Exhibition of 1851, being at that time only a dependency of New South Wales, and having a population of 77,000 inhabitants. It had since become an independent colony, and had now a population of 540,000. It appeared from the Custom-house returns that the export of gold in 1851 amounted to 145,000 ounces—equal to £580,000; whilst in 1860 it was 2,156,000 ounces—equal to £8,626,000; and the aggregate of the export in ten years was 24,000,000 ounces—equal to upwards of £95,000,000. In addition to this, there was an amount which did not appear in the returns, estimated at 2,000,000 ounces more, so that the whole export was 26,000,000 ounces—equal to £103,941,000. There were now 46 thriving towns. In 1851 there were 39 places of public worship, against 874 at the present time; 30 institutions for charitable relief, and a flourishing university. There were 860 schools, with 52,000 scholars; a public library of more than 30,000 volumes, with 117,000 readers in nine months. In the Exhibition of 1851 there were 37 trades represented in that department, and now there were 236. More than £5,000,000 had been spent in roads and bridges, and £3,000,000 in public buildings. There were 100 miles of Government railway open, and 182 more in course of construction, involving an expenditure of £8,000,000; 15,000 miles of electric telegraph, costing £163,000. Thus it would be seen that, in ten years, greater progress had been made in that colony than would have been the case, under ordinary circumstances, in a century in an old country. There were several points of interest connected with the details of preparing and washing gold, which he thought extremely worthy of attention; and with reference to the question of roasting or not, it must depend upon the peculiar circumstances and the quality of the quartz. He would not detain them longer by his own remarks, but would propose that in which they would gladly acquiesce, viz., a cordial vote of thanks to Mr. Phillips for the very able paper he had read.

The vote of thanks was then passed.

The paper was illustrated by a number of gold specimens from Australia, Canada, Nova Scotia, British Columbia, the West Coast of South America, North Wales, and other localities; also, a quantity of gravel mixed with waterworn crystals of sapphire, topaz, spinel, ruby, zircon, tourmaline, garnets, diamonds, platinum, &c., kindly lent by Professor Tennant, who also laid on the table a model of the "Welcome" Gold Nugget, found June 11th, 1858, at Bakery-hill, Ballarat. The weight of the original gold nugget was 2,166 oz. It was melted in London, September 22, 1859, and yielded quartz, earthy matter, &c., 146¼ oz.; pure gold, 2,019¾ oz. The value of the gold was £8,376 10s. 10d. This was the largest gold nugget known.

The Secretary announced that on Wednesday evening next, the 21st inst., a Paper by Mr. Gerald Ralston, Consul-General for Liberia, "On the Republic of Liberia, its Products and Resources," would be read.

POCKET ANEROID BAROMETER.

Messrs. Frankham and Wilson, of Wilson-street, Gray's-inn-road, have recently made some further improvements in this instrument, specimens of which were laid on the table at one of the Society's ordinary meetings some months since. This barometer is about one inch and a-half in diameter and three-quarters of an inch in thickness, and appears, from experiments that have been made with it, to be an efficient instrument.

Home Correspondence.

MR. WINKWORTH'S PAPER ON SILK.

SIR,—Allow me to say, in reply to Mr. Keith, that there is no mistake in the statement attributed to me. I have, by my process of spinning direct from the cocoon, produced organzine of 4½ to 5 deniers, a sample of which may be seen in my case at the Exhibition. I am weaving it also, and probably it is the finest thread ever woven, being equal to No. 1,200's. in cotton count.

I am, &c.,

JOHN CHADWICK.

12A, Mosley-street, Manchester, 13th May, 1862.

SIR,—I am obliged to Mr. Keith for pointing out the mistake in my paper "On the Silk Department of the recent Italian Exhibition," as to the prices of spun silk. He is quite right, for that article has never been so low in the market as 6d. per lb. I intended my quotation of values to apply only to the husks or waste out of which the silk thread is produced; but, from an omission or error in the wording, it appears to have reference to the latter instead of the former. I am, &c.,

THOMAS WINKWORTH.

Canonbury, May 12th, 1862.

NEW PROJECTILE FORCE.

SIR,—Some period of time must necessarily elapse before the beautiful theory propounded by Mr. Meschin can be so practically carried out as to become as much the every-day work of all men, as the present mode depending upon ordinary gunpowder. Now, as white gunpowder holds an intermediate position, in regard to its effects, between the common powder and the electric gas, would it not be as well to carry out some experiments as to its practicable application to fire-arms of every description—no alteration in the construction of the guns being required?

The explosive force of common granulated powder depends quite as much upon the rarefaction of the common atmospheric air included between the grains, as upon the gases evolved by the ignition of the powder itself, for when mealed, all projectile force is destroyed. White gunpowder, on the contrary, notwithstanding it is charged in a compact body, still ignites so rapidly as to produce, weight for weight, one-third more gas, and consequently one-third more projectile force, while the solid residue after combustion is scarcely perceptible. The barrel never fouls if the grease-sponge be inserted in the muzzle only, after every discharge; no loss of time will take place on that account, because the operation of loading is reduced to one act instead of five, as in the usual drill.

White powder is cheaper, weight for weight—can be stored and carried absolutely free from danger by accidental explosion, and is not liable to damp. As far as our experience goes, both the report and the recoil are sensibly less than with common gunpowder, and the smoke is nothing.

The best proportion for white gunpowder is 49 chlorate, 28 yellow prussiate, 23 fine lump sugar.

I should apologise, however, for having designated Mr. Meschin's proposal as a theory, because every position assumed by that gentleman has separately passed through the ordeal of practical demonstration by eminent men.

I am, &c.,
HENRY W. REVELEY.

Proceedings of Institutions.

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Haley Hill Working Man's College, Halifax.—The annual meeting of this college for the distribution of prizes and certificates was held on Tuesday evening, the 22nd April, presided over by E. Akroyd, Esq., the principal. Amongst those present were the Revs. W. Littlewood, M.A., H. B. Hall, B.A., W. H. Wawn, B.A., Messrs. T. S. Walsh, E. M. Wavell (town clerk), M. H. Rankin, S. Smith, Jno. Fisher, Dr. Pigott, &c. In opening the proceedings the chairman called on Mr. Gibb to read the report, from which the following are extracts:—" We now have on the books more names of students than on any previous occasion, while the number admitted during the past year is equal to the whole number now on the books. And in the latter case we perceive a fact which is much to be regretted, viz., the apparent instability of some of the students. One class, however, is a remarkable and pleasing exception to this rule; we refer to the theological class, which, though small in numbers, is well and regularly attended, and is, we hope, productive of much good. The staff of the college remains the same, with the exception of Dr. Paley, and great credit is due to them for their thorough method of teaching. The Principal and committee have this year the melancholy duty to record the death of the Rev. J. H. Gooch, late chairman of our local board for the Society of Arts examination. To his uniform kindness and readiness to assist in any scheme for the good of the students, they beg to bear their grateful testimony. And here we cannot but offer our most sincere thanks to Dr. Garlick, who has, in the kindest manner, taught gratuitously an extra collegiate class in geometry. Mr. Wainhouse, who teaches gratuitously the book-keeping class, must also have the satisfaction of seeing that his kindness is appreciated, as the number of his pupils is greater this year than it has been heretofore. The French class, conducted by M. Burluraux, continues as successful and popular as in previous years. The science classes, under Mr. Noble, still continue very popular in the college, and fully maintain their numbers. The elementary adult class, conducted by Mr. J. Spencer, remains in a most flourishing condition, although here also the same observation with regard to some of the students applies. Vocal music continues to be practised by a fair number of the senior division; among the juniors, however, it is hardly so popular, owing, perhaps, to the change of voice which takes place about that age. At the young women's institute a class has been formed, which has more than answered previous expectations. During the past year the library has fully maintained its character for usefulness, more especially with regard to home reading; the news-room is not so much used as it might be. A very large addition has lately been made to the library, and the theological department has been incorporated with the main division of the library; thus bringing the total number, inclusive of the juvenile departments, up to 4,500 volumes. Smoking, after certain hours, is now permitted, and many avail themselves of the privilege. We have improved our cricket ground, and rendered our bowling green one of the first in this part of the country. The literary and scientific society in connection with the college still continues in a prosperous state. A large case has been presented by the Principal, and is gradually being filled with specimens illustrative of the geology, botany, &c., of the district. A valuable collection of shells, illustrative of British conchology, and another of British fossils and mosses, have recently been added from the same liberal source as the case. We now come to the second great division of our system of education, viz.:—The Young Women's Institute. The same general remarks, with regard to the fluctuations in numbers, apply to this branch of the Institution as well as to the Working Man's College; as, however, a change of teacher has lately taken place, a little more excuse may be allowed. The needlework, one of the most important, and at the same time generally neglected branches of education, is fairly done; while the class in dress-making had advanced so considerably as now to be able to cut out and fit on dresses for each other, with only occasional supervision. The cooking class has been discontinued, on account of the small number of pupils; as, however a day-school cooking class has lately been established, this class was rendered to a great degree unnecessary; the latter, moreover, by supplying gratuitously nourishing food to the poor and sick when properly recommended, supplies a want long felt in a populous parish. With regard to the condition of the College and Institute, Mr. Watkins, her Majesty's Inspector says:—'*Men's Department.*—This department is in good order, carefully and intelligently taught, and making very creditable progress, and on the whole a valuable Institution. *Junior Department.*—The attendants here are much improved in order and regularity of attendance; questions are answered with much heartiness; there is a great deal of general intelligence among them, and good knowledge of the subjects taught. *Young Women's Department.*—The young women are in a very pleasing state of discipline, and very creditable in attainment. They have improved much in needlework, in which many of them are well skilled, and can cut out and make dresses.' Working Man's College;—Number on the books, 223; admitted since Easter, 1861, 226; Average nightly attendance, 96; weekly, 152. Young Women's Institute:—Number on the books, 67; average nightly attendance, 38; weekly, 42. List of Prizes (*Senior Division*). — *Arithmetic*—1st class, N. T. Balme; 2nd class, W. J. Priestly. *Euclid*—James Sutton. *Book-keeping*—Joseph Muir. *English History*—Jonas Robertshaw. *Scripture History*—Thomas Stradling. *Chemistry*—D. Parker. *English Literature*—William Brear. *English Grammar*—Ben Spencer. *Geography*—Hyram Hayne̵s. *Chemistry*—E. J. Mycock. *Physics*—J. Bland. (*Junior Division*). *Arithmetic*—1st class, John Dean; 2nd class, A. S. Holroyd. *English Language*—1st class, John Mitchell; 2nd class, O. Webster. *English History*—George Leech. *Geography*—Joseph Coates. Extra prize for general proficiency in the 3rd class — Joseph Wilson. Medallists (*Senior Division*).— Silver; Samuel Sutcliffe; Bronze, John Spencer. Extra prize—Edward Howarth. (*Auxiliary Class*).—Bronze; Thomas Robinson. (*Junior Division*).—Bronze; Walter Holliday, Samuel Oldfield, Samuel Schofield. Young Woman's Institute.—Prizes were given by Mrs. Akroyd for needlework and regularity of attendance."—The meeting was then addressed by the Principal, and by the Rev. W. Littlewood, after which Mr. Akroyd distributed the prizes, which consisted principally of beautiful work-boxes for the females, and medals and valuable books for the males. Mr. Akroyd then proposed a vote of thanks to the examiner; and the Rev. H. B. Hall, B.A., in seconding it, addressed the meeting for a few minutes, dwelling principally upon the importance of young women being trained to useful work in the homes in which they were destined to live. There was many a man who, like Achilles, was vulnerable in his heel when his stocking was not darned; and he was extremely glad that such simple yet necessary things had found a place in their studies. The Rev. R. L. Carpenter, B.A., moved, and E. M. Wavell, Esq., seconded, a vote of thanks to the Principal, which was carried by acclamation. An exhibition then took place, by means of the oxyhydrogen light, of photographic and other views, which were very beautifully rendered, and afforded much gratification. During the evening several pieces of music were sung by the choir, and two solos by Messrs. Peace and Briggs—Mr. Layton presiding at the piano. The room was tastefully decorated with flags and banners. The National Anthem was sung, after the vote of thanks to the Principal, and the proceedings terminated.

MEETINGS FOR THE ENSUING WEEK.

MON......British Architects, 8.
Royal United Service Inst., 8½. Capt. E. G. Fishbourne, "The Character of Gun best adapted for Naval Warfare, as gathered from the various plans of Guns proposed."
TUES. ...Civil Engineers, 8. 1. Continuation of Mr. H. C. Forde's Paper on "The Malta and Alexandria Submarine Cable." 2. Mr. C. W. Siemens, "On the Electrical Tests employed during the construction of the Malta and Alexandria Telegraph, and on Insulating and Protecting Submarine Cables."
Statistical, 8. Mr. J. W. Tottie, "On the Powers of the Inclosure Commissioners, and the Principles on which they have exercised them."
Ethnological, 8. Anniversary Meeting.
Architectural Museum, South Kensington, 8. The Rev. George Williams, "On Ecclesiastical Architecture in Georgia and Armenia."
Royal Inst., 4. Mr. C. T. Newton, "On Ancient Art."
WED. ...Society of Arts., 8. Mr. Gerald Ralston, Consul-General for Liberia, "On the Republic of Liberia, its Products and Resources."
Geological, 8. 1. Prof. R. Harkness, F.R.S., "On some Metamorphic Rocks in Banffshire and in East Sutherlandshire." 2. The Rev. D. Honeyman, communicated by the President, "On the Geology of the Gold Fields of Nova Scotia." 3. Mr. J. W. Salter, "On some fossil Crustacea from the Lower Coal Measures of Nova Scotia; on *Eurypterus;* and on some tracks of Crustacea in the Lower Silurian Rocks."
Pharmaceutical, 12. Annual Meeting.
Royal Soc. of Literature, 4½.
THURS...Royal, 8½.
Antiquaries, 8½.
Philological, 8½. Annual Meeting.
Philosophical Club, 6.
Royal Inst., 3. Dr. Lyon Playfair, "On the Progress of Chemical Arts."
FRI. ......Royal United Service Inst., 3.
Royal Inst., 8. Mr. Warington W. Smyth, "On Coal as one of the great materials of British Industry."
SAT. ...Linnæan, 3. Annual Meeting.
Asiatic, 3. Annual Meeting.
Royal Botanic, 3¾.
Royal Inst., 3. Prof. Anderson, M.D., "On Agricultural Chemistry."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par
Numb.

Delivered on 12*th*, 14*th*, 15*th*, 16*th*, 19*th*, 24*th*, 25*th*, 26*th*, *and* 28*th April*, 1862.

153. Graving Docks—Returns.
159. London Fire Brigade—Return.
152. Railway and Canal Bills—Fifth Report from Committee.
165. Navy (East India and China Stations)—Return.
166. Committee of Selection—Fifth Report.
172. Income Tax Appeals (Northampton, &c.)—Return.
151. Transport Service—Return.
162. Chigwell Inclosure—Return.
164. Courts of Justice Building Funds—Copy of a Memorial.
131. Superannuations (Public Offices)—Account.
163. Hops—Return.
178. Scottish Universities—Paper.
30. Railway and Canal Bills (153. Carmarthen and Cardigan Railway)—Board of Trade Report.
130. Increase and Diminution (Public Offices)—Abstract of Accounts.
143. Railways (Railway Accidents)—Return.
146. Treasury Chest (1860-61)—Account.
154. Criminal Offenders (Scotland)—Abstract of Tables.
168. Spirits and Wine—Returns.
170. Public Offices—Returns.
171. Thames Embankment Bill (Estimated Expenditure)—Report.
173. Militia—Return.
174. Woolwich Academy—Return.
175. Barrack Masters—Return.
176. Army—Return.
177. Coroner's Inquests (Metropolis)—Return.
180. Public Income and Expenditure—Account.
169. Great Grimsby Election—Minutes of Evidence.
112 (4.) Civil Services (Estimates)—Class 4.
112. Civil Services (Estimates)—General Abstract.
84. Bills—Small Tenements Rating (Scotland).
87. ,, Education of Pauper Children.
93. ,, Lunacy (Scotland).
95. ,, Metropolitan Building Act (1855) Amendment.
83. ,, Corrupt Practices at Elections.
85. ,, Companies, etc.
88. ,, Red Sea and India Telegraph Company.
90. ,, Customs and Inland Revenue.
89. ,, Merchant Shipping Acts, etc. Amendment (amended).
Education—Changes proposed to be introduced into the Revised Code.
Italy (Southern)—Correspondence.
Colonial Possessions—Reports (West Indies, Mauritius, and Ceylon), Part 1.
British Steamer *Orwell*—Correspondence.

Delivered on 29*th April*, 1862.

91. Bill—Assurances Registration (Ireland).
Victoria (Gold) Despatch.

Delivered on 30*th April*, 1862.

94. Bill—Grand Jury Secretaries (Ireland).

Dated 1*st May*, 1862.

43 (3). Trade and Navigation Accounts (31st March, 1862).
Manufactures, Commerce, etc.—Reports of Her Majesty's Secretaries of Embassy and Legation.

SESSION 1861.

518 (1). Property Tax, etc. (Metropolis)—Further Return.

Delivered on 2*nd May*, 1862.

187. Malt—Returns.
189. Hops—Return.
192. Royal Society—Return.
181. Poor Relief—First Report from Committee.
Southern Italy—Papers (Part 2).
Financial Condition of Turkey—Report by Mr. Foster and Lord Hobart.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, May* 2*nd*, 1862.]

Dated 24*th April*, 1862.

1194. J. Bond, Burnley, Lancashire—Certain imp. in projectiles, which imp. are applicable to horns attached to vessels for war purposes.
1196. J. Winsborrow, 4, Samson-terrace, Marlborough-road, Dalston—Imp. in wet gas meters.
1198. J. A. Traversier, 4, South-street, Finsbury—Some imp. in making ladies' bonnets.
1200. C. W. Belding, 7, King-street, Cheapside—Imp. in harrows or cultivators. (A com.)
1202. R. Mushet, Coleford—An imp. or imp. in the lining, repairing, or 'fettling' of puddling furnaces.
1204. R. Zimra, St. Petersburg—Imp. in stoves for heating and ventilating buildings.

INVENTION WITH COMPLETE SPECIFICATION FILED.

1244. W. T. Glidden, Massachusetts, U.S.—A new and useful mode of restoring phosphatic guano. (A com.)—April, 1862.

[*From Gazette, May* 9*th*, 1862.]

Dated 31*st December*, 1861.

3266. F. Tolhausen, 35, Boulevart Bonne-Nouvelle, Paris—A new method of, and machinery for, covering springs used for petticoats and other articles. (A com.)

Dated 1*st February*, 1862.

281. M. A. F. Mennons, 39, Rue de l'Echiquier, Paris—Improved processes for the recovery of the oleic acid contained in the residual scouring waters of woollen and other textile materials or fabrics. (A com.)

Dated 18*th March*, 1862.

746. M. A. F. Mennons, 39, Rue de l'Echiquier, Paris—An improved combination of cooling and filtering apparatus, forming a safe for the preservation of solid and liquid provisions. (A com.)

Dated 19th March, 1862.

763. R. Hadfield and J. Shipman, Attercliffe, Sheffield—Imp. in hardening and tempering wire and crinoline steel.

Dated 5th April, 1862.

979. B. Thompson, Walker, near Newcastle-on-Tyne—Imp. in steam engines.

Dated 7th April, 1862.

988. J. Watremez and A. Kloth, Aix-la-Chapelle—Improved apparatus for indicating a deficiency of water in steam generators.

Dated 8th April, 1862.

999. J. Jacques, jun., 102, Hatton-garden—Imp. in the instruments used in the game of croquet. (Partly a com.)

Dated 11th April, 1862.

1052. J. Howard, E. T. Bousfield, and T. Phillips, Bedford—Improved apparatus applicable to steam cultivation.

Dated 15th April, 1862.

1077. C. J. Coxhead, 10, Emeis-terrace, Kentish Town—Imp. in pianoforte actions.
1078. G. Fell and W. Haynes, Bolton—Imp. in machinery or apparatus to be used in the manufacture of leather.

Dated 19th April, 1862.

1149. A. Parkes, Liverpool-street, Birmingham—Imp. in surface condensers.

Dated 21st April, 1862.

1162. C. Callebaut, 4, South-street, Finsbury—Some imp. in sewin machines.

Dated 22nd April, 1862.

1168. S. S. Putnam, Dorchester, U.S.—Certain imp. in machines for forging horse shoe nails and other articles.

Dated 25th April, 1862.

1206. S. C. Salisbury, Coventry—Imp. in the construction of sewing machines.
1210. R. C. Mansell, Ashford, Kent—Imp. in the construction of wheels to be used on railways.
1214. J. Elder, Glasgow—Imp. in steam engines and boilers.
1216. J. Aspinall, Middlesborough-on-Tees—An improved apparatus for the safe conveyance from sea to land of ships' papers, documents, money, and other valuables when wrecks or other casualties occur at sea.
1218. A. C. Kirk, Bathgate, N.B.—Imp. in refrigerating apparatus.
1220. W. Hale, 6, John-street, Adelphi—Imp. in rockets.
1222. L. McLachlan, Manchester—Imp. in governing or regulating light used for taking photographic portraits and other photographic pictures, part of which imp. is also applicable to lighting picture galleries.
1224. W. E. Newton, 66, Chancery-lane—Imp. in chimneys for lamps. (A com.)

Dated 26th April, 1862.

1228. J. G. N. Alleyne, Alfreton, Derbyshire—Imp. in machinery and apparatus for the preparation and manufacture of iron and steel.
1232. F. G. Spilsbury and F. W. Emerson, Stratford, Essex—Imp. in the treatment of fusel oil, and for various applications of the same to useful purposes.
1234. H. W. Hart, Higher Broughton, Manchester—Imp in the manufacture of reflectors and shades for gas and other lights.
1236. G. H. Smith, North Perrott, Somersetshire—Imp. in the manufacture of crinoline or elastic hoops for dresses.

Dated 28th April, 1862.

1242. J. Fletcher, Farnham-place, Southwark—Imp. in the apparatuses for treating saccharine liquids.

Dated 29th April, 1862.

1250. S. W. Newington, Goudhurst, Kent—Improved apparatus for letting off and stopping the flow of liquids from casks and vessels, such apparatus forming a tap, and substitute for the ordinary vent peg.
1254. R. Bright, Bruton-street, Westminster—Imp. in lamps, and in apparatus for lighting Argand and other wicked lamps.
1256. W. L. Tizard, Mark-lane—Imp. in heating, cooling, and condensing apparatuses.
1260. E. B. Wilson, 5, Parliament-street, Westminster—An imp. in the machinery of apparatus used in the manufacture of malleable iron and steel.
1262. W. E. Newton, 66, Chancery-lane—Imp. in the construction of mowing and reaping machines. (A com.)

Dated 30th April, 1862.

1266. A. I. Mahon, 25, Leinster-square, Rathmines, Dublin—Imp. in projectiles.
1272. E. Leigh, Manchester—Imp. in the construction of ships and floating batteries, in mounting their guns, and in the application of steam power, parts of which improvements are also applicable to land batteries and forts.
1276. G. H. Birkbeck, 34, Southampton-buildings, Chancery-lane—Imp. in the construction of couches or settees for the purpose of sitting, lying, or reclining upon. (A com.)
1280. J. L. Norton, Belle Sauvage-yard, Ludgate-hill—Imp. in apparatus for drying fibrous materials and yarns.
1284. H. Willis, Albany-street, Regent's-park—Imp. in valves for the supply and discharge of gaseous bodies.
1286. W. T. Loy, Rood-lane—Improved machinery or apparatus for carding cotton and other fibrous substances of a similar character. (A com.)

Dated 1st May, 1862.

1288. W. B. Smith, Camborne, and W. Bennetts, Tucking Mill, Cornwall—Imp. in the method of, and apparatus for, preventing the injurious effects occasioned by smoke, sulphur, and the deleterious gases which escape from stacks, chimneys, calcining houses, chemical and other furnaces.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

1308. J. Tyler, 5, Kennington-place, Kennington-lane—Imp. in the manufacture of clarionets.—3rd May, 1862.
1333. F. Marrel, Marseille—Imp. in forming wrought iron bars for the manufacture of armour plates and other articles of forged iron. —5th May, 1862.

PATENTS SEALED.

[*From Gazette, May 9th*, 1862.]

May 9th.

2834. W. J. Hay.
2835. R. Bellis.
2836. J. Davidson.
2857. C. E. Wilson.
2859. F. Coney.
2860. R. A. Brooman.
2861. H. Bird.
2865. H. R. Fricker & J. Manley.
2882. J. Booth, T. W. Chambers, and J. Chambers.
2894. F. C. Paetow.
2069. R. Harcourt.
3271. W. E. Newton.
66. J. H. Tatum and W. J. Williams.
380. W. Hewitt.
537. J. Tangye.
571. H. Bowen.
752. W. Tongue.

[*From Gazette, May 13th*, 1862.]

May 13th.

2876. J. Spratt.
2885. E. D'Estanque.
2886. D. Stewart.
2887. R. T. Worton.
2888. J. Else and T. Godfrey.
2891. J. Hawkins.
2893. P. Andre, J. F. Pline-Faurie, & J. P. Richard.
2895. M. D. Rogers.
2896. R. A. Brooman.
2898. G. Prodon-Bonneton and M. G. Prodon.
2899. A. J. Mundella and W. Onion.
2901. L. Smith and M. Smith.
2903. T. Redwood.
2917. F. Puls.
2918. L. Thomas.
2931. A. F. Yarrow and J. B. Hilditch.
2935. T. W. Davenport & S. Cole.
2958. J. Willcox.
2976. J. H. Johnson.
3034. W. E. Newton.
3164. A. V. Newton.
3227. G. H. Birkbeck.
35. H. D. Pochin.
598. W. Hensman and W. Hensman.
603. W. E. Newton.
910. M. Henry.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

[*From Gazette, May 13th*, 1862.]

May 6th.

1142. T. Jones.
1149. M. Henry.
1153. R. Pearsall.

May 7th.

1275. A. V. Newton.

May 8th.

1160. F. V. Hadlow.
1314. L. Farrenc and B. Subra.

May 10th.

1229. R. Romaine.
1316. G. Hadfield.
1437. A. V. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

[*From Gazette, May 13th*, 1862.]

May 5th.

1085. R. McConnel.

May 6th.

1031. J. Bowron.
1091. R. S. Newall.

May 7th.

1030. J. A. Williams.

May 8th.

1044. D. Morrison.
1045. G. Taylor.
1057. J. Harrison and T. Summerson.

May 10th.

1071. J. Herdman.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Name.	Address.
4477	May 8.	Double-breasted Waistcoat	James Cocks	25, Cornhill, E.C.
4478	,, ,,	Improved Shooting-Coat Pocket...	James Cocks	25, Cornhill, E.C.
4479	,, 10.	Improved Oil Can	I. Timmins and Co.	15, Brearly-street West, Birmingham.
4480	,, 13.	New Lever Check-Winch for Fishing ...	Thomas Aldred	126, Oxford-street. W.